The Mining Journal.

No. 432.] ENLARGED SHEET. [Dec. 2.

TO ENGINEERS, RAILWAY CONTRACTORS, MINING AGENTS, IRONMASTERS, and OTHERS REQUIRING FINE GREASE for MACHINERY and AXLES of every description.—JOSEPH PERCIVAL'S IMPROVED ANTI-FRICTION GREASE is—after trials on machinery and axles of every kind where constant friction is kept up—admitted to be the most useful, economical, and best preparation of the kind ever offered to the public.

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BARON VON RATHEN'S ADDRESS TO PROPRIETORS of STATIONARY, MARINE, and LOCOMOTIVE STEAM-BOILERS, and of SUGAR and SALT FACTORIES, BREWERIES, DISTILLERIES, &c.—Baron VON RATHEN has the honour to offer to proprietors of steam-boilers, especially of steam-vessels navigating the Atlantic or Mediterranean, the use of his PATENT UNDULATED FIRE GRATE and METALLIC FLUES, which are perfectly simple in their construction, and cannot get out of order, being free from any mechanical contrivance whatever. The Baron Von Rathen's patent apparatus have been applied with great advantage to boilers before in use, of which facts, reports, and testimonials, from highly respectable parties, were published in this Journal on Saturday, November 18, 1843, and the originals of which can be seen on application to the patentee.—The advantages which the patentee is enabled to secure to parties who may adopt his plans, are as follow:—

1. Economy in fuel, to the extent of from one-third to two-thirds of the quantity now consumed, according to the greater or less perfection of the present arrangements, quality of fuel, and other peculiar circumstances.

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3. Durability of every part of the boiler, and consequent safety from explosion. This advantage is obtained by the more equable distribution of the heat over the surface of the boiler, and the great freedom from sediment and incrustation, which results from the use of the metallic flues, the manner of which the patentee will be happy to explain upon application to him.

4. The prevention of smoke by the more perfect combustion of the fuel and all its gaseous products in the fire-place and before the bridge, for which the arrangements adopted have been found quite successful.

The patentee will undertake to fix his patent apparatus, at his own expense, to steam-boilers or evaporating pans now in use, or he will grant licenses to engine or boiler makers.

For terms and further explanations, apply to the Baron Von Rathen, care of Edward Burbidge, Esq., solicitor, 26, Hatton-garden, London; or to Messrs. Fletcher and Co., Congreve-street, Birmingham.

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[illegible]

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DAVID FOGGO, Secretary.

N.B.—Agents are wanted in towns where appointments have not yet been made.

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[illegible]

IMPORTANT RAILWAY IMPROVEMENT.—As the construction, the peculiar application of the material, and the principle on which carriages are worked upon this railway, are new to the public, it has been considered not only necessary to lay down a specimen, but also to give a concise description of it, and to point out the many advantages it possesses in regard to safety, economy, and durability.

The rails are formed of wood, prepared by Payne's process, which imparts to the wood sufficient tenacity to take the place of iron; and experience proves, that, on wood rails, carriages can with ease ascend an inclined plane, with a rise of 1 in 20.

To enable carriages to run with safety on wood rails, wheels of a peculiar construction are necessary.

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The process is in extensive operation at Whitehall Wharf, under Government patronage, having been minutely investigated, and favourably reported upon, by that eminent chemist, R. Phillips, Esq., as well as by several other distinguished chemists and engineers.

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TO MERCHANTS, SHIPPERS, AND COLONIAL AGENTS.—The DIRECTORS of the SEYSSEL ASPHALTE COMPANY are PREPARED to EXECUTE ORDERS for the IMMEDIATE SHIPMENT of this MATERIAL, which, for the convenience of transport, is manufactured in blocks weighing each about 1 cwt. The blocks are of two kinds, the one (impervious to damp and vermin) for pavement and floors generally; the other for covering of roofs, terraces, vaults, and arches, where it is desirable to keep wet from penetrating or damp from rising, as a cement for brickwork, for lining of tanks, reservoirs, &c.

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J. FARRELL, Secretary.

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A carbonaceous record ink, which writes instantly black, and being proof against chemical agents, is most valuable in the prevention of frauds.

[illegible]

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[illegible]

STEPHENS'S SELECT STEEL PENS.

[illegible]

THE BOCCIUS LIGHT.—The PATENTEE is NOW READY to SUPPLY BURNERS, of any dimensions, to the public. [illegible]

IMPORTANT PATENT IMPROVEMENT IN CHRONOMETERS and WATCHES.—E. J. DENT, 82, STRAND, [illegible]

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The provisional committee sit every Monday evening, from Six till Nine o'clock, and will feel happy in affording every further information respecting the objects and plans of the association.

By order of the provisional committee,

A. GOLE, Secretary.

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The subscription is now placed on so moderate a scale as to be no object of consideration, in proportion to the conveniences offered, which are set forth in the above prospectus; and the board are of opinion, that, without interfering with any of the existing establishments appropriated to specific branches of trade, these conveniences may be found available by a very large body of persons in the city of London, by parties visiting London occasionally on commercial affairs, and by gentlemen from the Continent and other foreign ports.

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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Marquis of Exeter, K.G.	[illegible]	[illegible]

[illegible]

The Right Hon. Earl of Aberdeen, Her Majesty's Principal Secretary of State for Foreign Affairs.

Annual subscription, [illegible]; Quarterly subscription, [illegible].

[illegible]

MINING IN THE MIDLAND COUNTIES OF ENGLAND—No. 1.

A voluminous report of the Midland Mining Commission, on the physical condition of the mining population of South Staffordshire, Worcester, Warwick, and Salop, by Thomas Tancred, Esq., who was commissioned by Government to make a special inquiry into the condition of persons employed in mines in those counties, has just been published, having previously been laid before both Houses of Parliament. Though confined to South Staffordshire—and, consequently, of a local character—this report contains so much important information connected with the physical and moral condition of the population in these districts, and which may give a very general idea of the habits of the miners in the other coal districts of Great Britain, that we shall, in an extended series of papers, lay the whole, in as condensed a shape as its interest and importance will admit, before our readers.

The geological features of the district are first described, which are, in many respects, without a parallel in the world, and it would scarcely be believed how very intimate is the connection between the condition of the inhabitants on the surface, and the geological strata beneath it. The coal-field under notice consists of what is termed the "thick coal," being a vein thirty feet in thickness, with several thinner veins of from two to five feet, surrounded on all sides by the outcrop of the new red sandstone formation—the coal measures at the line of junction being usually broken suddenly off by faults; the extreme length of this basin is twenty-one miles, and about from six to seven miles in breadth. To a stranger traversing this part of the country, the appearance is singular in the extreme. He appears to be threading the streets of an interminable village, from which there seems no escape; he may travel for miles, and never be out of sight of numerous two-storied houses, interspersed with blazing furnaces, heaps of burning coal in process of coking, piles of ironstone under calcination, forges, pit banks, and engine chimneys. The country is intersected by canals, and the few patches of cultivated soil on which corn or grass may be growing are intermingled with heaps of the refuse of the mines, or slag from the blast furnaces. Beneath the surface, the whole district may be compared to a vast rabbit warren; so insecure is the ground above, from the extraction of the coal beneath, that it is no uncommon circumstance to see a whole row of dwellings, tumbled into the most zig-zag and irregular outline from the subsidence of the earth below, and the greatest difficulty and apprehension is experienced when about erecting any large building, as a church, school, &c., to obtain a safe foundation. In the parish of Sedgley, the church and parsonage house are composed of wooden framework, so constructed that they can be screwed up to a perpendicular, when by the undulations of the ground they have been thrown out of it. Carbonic acid gas and carburetted hydrogen often fill the cellars of houses, and render them dangerous to enter; and near Dudley early potatoes are raised for the London market, in ground heated by the steam and gases emitted from an old colliery which has been on fire for many years. These peculiar circumstances, so different from those of other parts of the kingdom, the clouds of smoke and heaps of dust which drift across the country, have effectually driven away all classes, excepting those whose daily bread depends upon their residence within these limits, and the character of the population, in moral rectitude and education, is, in consequence, very low indeed. The transition from the coal measures to the new red sandstone is distinctly marked, not only geologically, but in the nature of the inhabitants; the whole circle formed at the junction is occupied by a race scarcely a remove from the savage—viz., those employed in the manufacture of nails; their moral habits, dwellings, food, and general character, rank very low in the social scale, and they are exposed to every imposition from the agents to the nail masters, and all the evils of the truck system. Men are to be found who will take the iron from the masters, give it out to the nailors, collect the nails, and return them without pay, realising a large profit by compelling the makers to buy their goods; they sell everything—beer, bread, flour, clothing, &c.—and, by this system of extortion, render the situation of these degraded beings of the most wretched description; they are never visited by churchmen or dissenters, and appear a race almost separated and distinct from the rest of the community. After passing this, as it were, natural boundary, the features of the country change; wooded hills, ancient parks, and the smart houses of the tradesmen and ironmasters, relieve the prospect; ancient cottages covered with ivy, venerable parish churches, residences of nobility and gentry, and fertile fields greet the view, and carbonic fumes and sulphureous odours are replaced by the fragrant scent of the meadow or turnip field, while the songs of birds are heard in place of the whizzing of steam, and the creaking of the engine. The following extract from Mr. Murchison's description closes this section of the report:—"Owing to the great disturbances to which that part of the field which contains the 'ten-yard' coal has been subjected, whether by the upheaving of the trap or siliceous rocks, or by great dislocations, the coal measures are reached at very various levels in different localities. Thus, in some situations, shafts are sunk through shale and clunch, with bands of sandstone, to depths exceeding 100 yards, before traces of coal are met with; while, in many collieries (as near Wednesbury) all the overlying masses of coal, and coal [illegible], which connect the coal measures with the lower new red sandstone have been removed, or have thinned out, and the ten-yard coal rises at once to the surface. It was this natural outcrop of the thick coal which led our ancestors to work it in open quarries. It has been stated that the lower coal and ironstone measures crop out from under the ten-yard coal, and extend into the great Wolverhampton field; in their spread to the north, however, these strata assume very different characters from those which they possess where they underlie the thick coal in the portion of the field south of Bilston and Wednesbury. In most of the works which have hitherto been established in the region of the ten yard coal, three courses only of workable iron ore have been obtained, whilst in the Wolverhampton district six valuable bands are wrought."

The second section of the report is on the rise and progress of the iron manufacture in Great Britain, which manufacture creates so large a demand for labour in South Staffordshire. All the iron made in early times, [illegible], being smelted with charcoal, in the first year of Elizabeth's reign, its effect in producing a scarcity of wood was felt, and Acts of Parliament were passed, confining the establishment of iron-works to certain localities. The importation of iron from Russia and Sweden was considerable until 1788, when, in consequence of the introduction of the steam-engine, a new era in its history commenced, and in 1839 there were in blast 378 furnaces, which produced 1,347,790 tons of iron, being an increase over 1838 of [illegible] tons. The next subject which the author considers in the report is the [illegible], resulting from the strike of the miners in Staffordshire. He observes, a question of wealth and population so rapid as that which has resulted from the great [illegible]

[illegible]

by the stint, a certain measure of work about two yards thick, 2 ft. 3 in. high, and three feet wide; thus, if work is plentiful, and the coal moderately soft, a skilful man can get through his stint in eight or nine hours, and leave him the rest of the day to himself, and although the position of the body is oftentimes confined, and the labour hard, the employment of the pikeman is looked upon as the best under ordinary circumstances, and is the object of ambition of the young and vigorous miner. Next to the pikemen are the bandsmen, who are paid by the day of twelve hours; the [illegible] break the huge masses of coal into manageable pieces, which the loaders place on the skips, and surround with iron hoops, while the dirt carriers take back the slack in iron baskets to the empty space behind where the men are working, called the gob; the Staffordshire coal-field is happily exempt from the reproach of ever having employed females under ground. The author visited the Heath Colliery, in company with Mr. Raybould, the lessee, and Mr. M'Duff, the "doggy;" this pit is most interesting in a geological view, having been the first attempt to find the ten-yard coal by sinking through the new red sandstone, and this attempt having been successful, corresponds in importance to finding the Durham coal extending beneath the magnesian limestone. A detailed account of all the strata cut through will be found in Murchison's *Silurian System*; the depth is 308 yards, very dry, and the main road lit with candles permanently fixed in the walls—an expense not usually allowed, but which Mr. Raybould said prevented accidents. The pikemen universally prefer holing as the easiest work, though they have to sit in a place only 2 ft. 3 in. or 4 in. high, where they cannot straighten the neck, for in beneath a mass of coal some twenty-eight feet thick; this and the other works cause great development of the muscles of the back, chest, and arms, and, but for the noxious gases which they are obliged sometimes to inhale, the thick coal miners could not be surpassed in health by any class of men. The Blakemore ironstone pit at Corngreaves, the property of the British Iron Company, was next visited. The seam of white ironstone is only about six inches thick, and lies fourteen yards beneath the thick coal; the shaft is 194 yards deep; the gate road about four and a half feet high, sufficient for small ponies, which are used to draw the waggons; below the ironstone is a shaly claystone, and beneath this a thin vein of coal called the stinking coal, from the sulphury exhalations given out in burning. A white sandy rock is left for a roof; the holers have a stint of seven yards along the face for a day's work, which they have to cut 2 ft. 6 in. deep, and for which they receive 2s. 6d.; the builders up have to make good six yards in length, and one in depth, to the height of the roof in a day, for which he is paid 3s. 6d. There are sixty acres of stone commanded by this one shaft, and if no other is sunk, it will be the largest quantity ever worked by one pit in the county; the iron miners are liable to be affected by asthma, but accidents are not near so frequent as in the thick coal pits.

The grievances to which miners are exposed will be the subject noticed in the next paper founded on this interesting report.

REMARKS ON THE PRESENT STATE OF THE COAL TRADE.

A pamphlet under the above title—presenting a retrospective glance at the history of the coal interest, and the various imposts which have from time to time been levied, with various circumstances which have affected the returns to the owners, and the supply and cost to the consumer—has just been published by Messrs. [illegible], of Newcastle-on-Tyne, and is addressed to the Marquis of Londonderry; the author, who signs himself "Anti-Monopolist," is evidently well qualified for the task, and handles his subject with considerable judgment. The object of the work is to call attention to the present unprofitable nature of coal mining adventure in the north, and to investigate the causes of such calamity. After noticing the antagonism which has ever existed between superior and inferior coals, which seems like the natural antipathy of different races inherent and inextinguishable, but repressed and stifled for periods from weariness of warfare, or reasons of policy leading to concession and compromise, the author proceeds to show the effect of "the regulation" among the coal-owners, for the purpose of combining the various collieries in their sale, and regulating the prices to the consumer, and contends that it is necessary, not only for the benefit of the coal-owners themselves, but for the interest of the public. This "regulation" existed prior to the revolution of 1688, and it caused such notice that, in 1710, an Act of Parliament was passed, "to dissolve the present, and prevent any future, combination of coalowners, lightermen, masters of ships, and others, to advance the price of coals." This Act was passed for three years only, but was made perpetual by 1st Geo. I., stat. 2., c. 26. Its provisions, however, appear to have had no effect in deterring the coalowners from keeping up the coalition, and, within twenty years, so great a ferment arose, and all other measures having failed, the corporation of London was empowered by Parliament to fix the price at which coals should be sold within its jurisdiction. The charges brought against the great coalowners of that day, who were called "the grand allies," were—engrossing great numbers of collieries on lease, which they worked, saving their own estates for futurity—paying annual sums to small owners not to send more than a certain quantity into the market—getting possession of all the land they could on the banks of the Tyne, and preventing access to it with coals—and the engrossment of "way-leaves" to such an extent, that it was difficult to find an unwrought colliery to which the way was not stopped, as they paid dead rents for way-leaves not to use them, but to prevent others from doing so. About 1771, Mr. Francis Thompson, manager of Washington Colliery, found great irregularities in the trade. At this time the "regulation" was evidently not in existence, as he states that over measure was largely given by the competing coalowners, and prices were so low that his employers had but miserable returns for a sunk capital of 15,000*l.* He communicated his sentiments, meetings were held, he was appointed secretary, and an agreement was entered into for the future regulation of prices, which were fixed at 11s., 12s., 14s., and 15s., free on board, according to the quality, and at this time the best coals in London were [illegible] per chaldron. The question as to whether the inferior collieries could exist, if in competition with the best, was much discussed at that period, and is still a debateable point. Mr. Thompson asserts that, in the event of the owners of best coals refusing to limit their vends, the inferior sorts must, of necessity, be driven out of the market. The author shows, however, that such must not, of necessity, be the case, but that, on the contrary, the owners of the superior coals have always found it necessary to sustain the inferior competitors, and admit them to a fair participation in the benefits of the trade. In 1787, under a new agreement among the coalowners for the determination of prices, and limitation of vend, the prices were raised considerably above the standard of 1771, the best coals costing on board from the Tyne per chaldron [illegible], and [illegible] on the Wear—the limitation of vend being three-fifths for the Tyne, and two-fifths for the Wear, which basis was apportioned among the collieries according to the standing of each in the trade. In [illegible], coal from the Walker Colliery, the first opened of the Wall's End batch, fetched [illegible] per chaldron; this discrepancy with the price at Newcastle was entirely owing to the dealers in London, of whom the author thus writes:—"The Coal Exchange itself was a closed market, and no one could buy upon it but a few privileged individuals, who took care to exclude new competitors. Thus, while the corporation of London, with its revolving [illegible] of Lord Mayors, was [illegible] denouncing the [illegible] of the north, it [illegible] within its own bosom, in the [illegible] of Billingsgate, [illegible] under the wing of corruption." So gross had become the monopoly of the coal trade in the hands of the corporation, that Parliament was aroused, and from [illegible] to [illegible] no less than five Acts were passed to regulate the sale. The 47th of Geo. III., sec. 2, c. 68, repealed all these, and embodied provisions, which were acted on for years afterwards—still, however, leaving [illegible] to gall the trade. A committee of the House of Lords [illegible] a full exposure of the corruption, a strong feeling of indignation was aroused in all quarters, and in 1831 the duty of 6s. per chaldron was abolished, [illegible], the selling by measure was also abolished, and weight substituted, and the [illegible] of the trade struck off. The author then proceeds to notice the [illegible] which took place in [illegible], when the [illegible] of London [illegible] against the coalowners of the north, and the Lord Mayor [illegible] [illegible]

by several competent witnesses, and its beneficial effects to the country at large were demonstrated by undoubted testimony. The work, which extends over fifty-two pages, is ably written, and is worthy the perusal of all persons connected with the coal trade; it contains the most important parts of the evidence of Mr. Brandling, Mr. Henry Morton, Mr. Hugh Taylor, and Mr. Buddle, on the charges made against the coalowners of the north, and concludes with some interesting statistical data as to the number of new winnings, progressive increase in the production of coal, number of individuals employed in mining, the ships engaged in the coasting trade, and the seamen by whom they are navigated, some of which particulars we shall embody in a future article.

ON THE IMAGINED PROBABLE ESTABLISHMENT OF A TRADE IN AMERICAN COAL WITH EUROPE.

A letter by the Hon. C. I. Ingersoll having recently been published in America, in which he discusses the *facilities* and *capabilities* which exist for supplying the whole of Europe with anthracite from the coal district of Pennsylvania, Mr. R. C. Taylor, of Philadelphia, has collected some valuable data, by which he shows that it will be impossible to establish a profitable trade in coals between the United States and Europe. He takes the most prominent paragraphs, each separately, as a text, commenting as he proceeds, and introducing statistical matter as an answer to the writer's assumptions. Mr. Ingersoll says—"*They have no coal in France*, except some small quantities imported from Belgium, and that bituminous, which the French do not like. There are coal beds in parts of France, *but not used*. The French have facilities for manufactures almost equal to the English, but they want fuel." To this it is replied, that there are forty-six distinct coal basins in France, of which two alone employed 32,000 workmen in 1836. In the districts of the Loire and the Nord, the extent of ground covered by establishments at work was 42,038 English acres—that the quantity furnished by these beds is annually increasing at an enormous rate, having quadrupled in twenty years. In France, the proportion of consumption is one ton to 6⅔ persons—in America one ton to five persons—and in England one ton to each person; that there are 3000 manufacturing establishments in France dependent on its coal, which also furnishes employment in its production to 6000 labourers more. In fifty years she had increased the produce of her coal mines from 225,000 tons to 3,229,000 tons, with abundance in reserve; and how, in the face of these facts, can it be said—"France has no coal?"—"Is it not worth, at least, a cheap experiment, whether coal cannot be introduced into more extensive use in various parts of Europe?" In answer to this, recourse is had to data respecting the cost of coal at the French mines. From official returns for 1838 and 1839, the prices were—Coal of all descriptions at the mines, 2·72 dols. per ton; in all France, where consumed, 6·07 dols. per ton. In 1841, Nantes was supplied with coal from the interior at 4·61 dols. per ton, and at Mouzeil coal was delivered within twenty miles of the mine at 3·75 dols. per ton. In addition to her native produce, France imported, in 1789, 236,092 tons; in 1840, 1,197,500 tons; and in 1841, 1,500,080 tons. Nor let it be supposed there is no anthracite in France. In 1836 there were forty mines of anthracite in that country; these are increasing in number; the beds, in some instances, are thirty-three feet thick, and the quantity raised is daily augmenting; the price is 2·65 dols. per ton. From 1816 to 1839 the quantity of bituminous coal increased *fourfold*, while anthracite increased fourteen fold, and twenty-one fold in aggregate money value.—"There are only two obstacles in the way of our sending anthracite coal from Philadelphia to Havre; one of these is the French imports, and our stone coal might be delivered at Havre for 9 dols. per ton." In 1837 the import duties were equalised with those of England, equal to 2s., or 48 cents., per ton; the same policy extends to Belgium, who, while she buys from England, sells to France, and these, like those of England, are annually increasing, for in 1813 they were 90,000 tons, and in 1839 were 740,000 tons of coal. It is very doubtful if Pennsylvanian coal could be delivered at Havre for 9 dols. per ton; but, would the merchants pay that price, to say nothing of import duty, when they could get it from Ireland for considerably less, and from Wales for half that price? Stone coal has never been higher than 2 dols. per ton on board at all the Welsh ports, and the freight to the Thames at London, a circuitous route, much further than the French coast, would make it 3·40 dols. per ton, and it has been sold for less. Schuylkill coal has been retailed in New York at double that rate, while Newport semi-bituminous coal has been delivered regularly for years to the Cornish mining establishments at 12s. per ton, which is equal to 2·90 dols. American currency. As regards anthracite, a fuel not employed out of the immediate region, it has never been in request in the British markets; the little that has been used has obtained from 50 to 75 cents. more than the average bituminous coals.—"English coal has lately been subjected to a heavy export duty, so that it is almost impossible to introduce it into France." Formerly, for many years, the export duty used to be equal, on large coal, to 3·19 dols. per ton; in 1831 it was made 10s., or 2·42 dols., per ton on all descriptions of coal or culm in foreign, and duty free in British, vessels; in 1834 the tariff was revised, and the duty became, for large coals, in British vessels, 3s. 4d., or 80 cents., per ton, and in foreign 6s. 8d., or 1·62 dols., per ton; and by the tariff of 1842 it was made 2s., or 48 cents., for coal exported in British vessels. This continued decrease in the amount of duties has produced the following results:—Average of twenty years' importation of coal into France, from 1814 to 1834, 30,000 tons; in 1834, 48,000 tons; and in 1840, increased to 1,000,313 tons. These facts prove how far the above paragraph is correct—the reverse will be seen is the case; for, whereas, thirty years ago, the combined English and French duties were 6·52 dols. per ton, they are now only 48 cents. for large, and 24 cents. for small coal.—"I am persuaded that American coal, &c., may be disposed of in much larger quantities than at present, by turning our attention to the nations of continental Europe." France ranking high among the great manufacturing nations of the earth, has a rapidly-increasing demand for coal. Her mines yield her a continually augmenting supply, while she is also at present compelled to resort to her neighbours, and from Belgium, Rhenish Prussia, and Great Britain, she receives large and equally increasing supplies. The obstacles to be encountered by America in this trade, and which must be surmounted to insure success at all times, are the vast amount of coal in Europe yet untouched, but available at any moment, when needed, particularly South Wales and Ireland—the contiguity of which coal regions to the sea shore, and their convenient proximity to the continental market, while the American coal is 150 miles inland, and the places of shipment 3000 miles, at least, further than the coal-fields of Great Britain. [illegible]

[illegible]

GEOLOGICAL CHARACTER OF THE SOUTH-EASTERN BOUNDARY OF THE SOUTH WALES COAL-FIELD.

BY MR. A. O. DAVIES, MINERAL SURVEYOR, CARDIFF.

[Concluded from the Mining Journal of Oct. 19.—From the Monmouthshire Merlin.]

The strata from here dips west, commencing with a fall of a foot in a yard; but at the distance of about a mile a head, it has lessened to two or three inches in a yard, which brings us into the main trough, or centre of the basin, where the measures rise north and south. The course the centre of the basin takes is by Newbridge Inn, Pontwynmawr, near Woodfield pit, across the river Rumney, by Penallta Rock, to within 200 yards south of Gellygaer deep pit, thence across the river Taff, near the Navigation House, through Ynysybwl, in Lanwonno, in the Vale of Rhondda, which it crosses at a place called Gyfeillion. This comprises the extent of district under notice. I shall commence at Sirhowy with the transverse section, where the coal and mine measures basset out to the north; from here to a little below Woodfield pit, near Blackwood, the strata dip about three inches in the yard, a distance of ten miles; then the south rise commences at the rate of three inches per yard, for the distance of three miles, to a place called Y Felin Vach, where the strata form what geologists denominate the anticlinal axis, and what miners technically term a saddle back; thence the strata take to dip southwardly for two miles farther, when they arrive in the hollow of the smaller trough, already mentioned, below Quarrmawr, whence the measures rise south for about three-quarters of a mile, at the rate of from two to four inches per yard, and then they take an abrupt and rapid rise for more than a mile and a half, and bassetting on the hill above Risca at a rise of eighteen inches per yard. I have taken the Sirhowy Valley to illustrate the transverse section, because the localities may be more familiar to you; but I will not lose this opportunity of informing you that from the terminus of the Rhondda branch of the Taff Vale Railway to the Nantgaw tunnel is one of the finest treats in this country for a geologist, the railway operations having denuded and exposed the edges of the various strata, so as to exhibit the transverse undulations of the basin, with the anticlinal axis at Pontypridd, and the centre of the basin at Gyfeillion, together with the synclinal axis of the lesser trough, at Rhyd Elyg. These facts can be ascertained in other valleys, but not so easily as in the Taff and Rhondda. The great obstacles to mining operations are certain phenomena which I shall describe under the different heads of faults, dykes, swamps, rolls, and creeps. A fault is a dislocation of the strata, deranging the positions of the various veins contained therein, caused, according to the Huttonian system of geology, by the expansion of subterranean fire. Dr. Hutton's theory is this, and easily explained, I believe:—"Within the nucleus of our earth there exists a fire," called by him "central fire," which is at times "quiescent or active (as the case may be); but, when the various volcanic vents distributed over the globe become too inadequate to allow the expanding vapour to escape, Nature, desirous of disengaging herself, rends asunder some devoted spot into a thousand pieces, which, after the subsidence, fall back by their own gravity; but the dislocated portions, getting 'joggled' together, seldom regain their original position." An instance is to be seen in Calabria, after the last earthquake there; indeed, in Walker's colliery, on the Tyne, there is a vertical dyke through the strata filled with lava, which must have been injected in a fused state from below; it is called the white dyke; and as a proof of the whinstone being a vitreous substance, the coal abutting on it is now to be seen on each side, actually charred and converted into coke for some feet off. The foregoing is my opinion of the cause of faults; now for the effects in this district. At Dinas rock, above Hirwaun, is a fault of great magnitude, the derangement of the strata being so great, that the coal measures on one side abut against the limestone on the other. Some eminent geologists have supposed that the great faults of the northern rise take their course across the centre and through the southern rise of the basin. Of this opinion I should wish to disabuse their minds; for from what I know of the district under notice (that is, from Pontypridd to Pontypool), more particularly the south rise, which I have for some years carefully studied and examined, both over and underground, I fearlessly assert there is no such continuity, as I shall presently show. On its course from Merthyr, passing Fhidgaiach, and north of the Gellygaer deep pit, taking an easterly direction towards Penallta rock, is a fault of above fifty fathoms upthrow north, at Gellygaer, decreasing as it approaches the centre of the basin; on the southern rise, about half a mile south of the deep pit before mentioned, is another fault (south upthrow) of more than sixty fathoms, running parallel with the centre of the basin, and increasing in magnitude in its eastern course, towards Gellydeg farm, near which the other runs into it, and becomes annihilated—this fault also becoming much less through the same cause, but it still increases gradually eastward towards Gellygaer, where the coal is thrown up south more than twenty-five fathoms, thence to where Brynmar brook crosses the turnpike-road near Penthevraith, where a branch runs off in a north-east direction to Twyn-y-college, which throws the coal up to the south from Cwm Filkin pit to the Cwm Dws level, eighteen fathoms; it soon after branches out into two or three smaller ones, which become soon spent in the Kendon and Tribeent Collieries, or lost in larger ones. To return to the Brynmar brook; the main fault, which is now only thirty-five yards, or thereabouts, still pursues its original course eastward, and close to the main trough of the basin. The last effects of it are to be seen at Sir B. Hall's tunnel, under which the coal vein lies a few fathoms, whereas a few score yards to the south, the coal is thrown up to the breast of the hill at least thirty-five yards, where it was worked some years ago, by the Messrs. Vaughan, of Caerphilly; this fault, near Newbridge Inn, is lost in a large fault (unexplored). Taking a north-east course towards Kefn Crib, the gut, or fissure of this fault, is to be seen on the canal side between Crumlin and Newbridge, and is at least seventy yards wide; it is a south upthrow, but how much is not yet ascertained. A very large fault runs from the neighbourhood of Merthyr through the lower part of Gellygaer Mountain and south-west corner of Gilvach-fargoed farm to Pontaberpengam bridge, where it cannot be less than fifty fathoms downthrow south. Its effects can be traced also to Gellyhaen; for instance, the coal that is worked by level at the place, is, a few hundred yards below, worked by a deep pit at the Fleur de Lis; its magnitude greatly diminishes as it approaches the centre of the basin, and between Beys and Penllwyn it comes in contact with a number of cross faults, and becomes completely spent. All faults on the southern rise, of any magnitude, have a tendency to run east and west, and are upthrown south until we get at the great downthrow south, which traverses the country from Twyn Barlwm on the east, crossing the river Ebbw near Pontywaun, the Sirhowy below Quarrmawr, the Rumney above Caerphilly, and the Taff near Maesmawr Colliery on the west. There is a cross fault near the east end of the basin, taking its course through the hollow between Twyn Barlwm and the Mabbot-Hill, in a north and south direction; about half a mile above Cwm Carne Mill it comes into the course of the brook, which it keeps for nearly two miles, having the fissure denuded by its waters, until it passes the mouth of Mr. Hanson's level in Cwm Carne, pursuing its course into Mynydd-maen Mountain, towards Pont-y-doctor; this fault not having been yet explored, from examination of the strata, I think it is from fifteen to sixteen fathoms upthrow east. There are numerous cross-faults on the north rise, too numerous to name, being well known in their localities, but of minor importance. The rule by which the miner is guided in his opinion of a fault is this; having cleared the fissure and exposed it to view, he then fixes it to see whether it inclines or declines from [illegible]

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and corresponding convexity in the roof, of a vein of coal, sometimes 200 or 300 yards in extent, and is a great obstacle to the well-draining of a colliery; but there is a self-acting machine, which, from its simplicity, is seldom made use or even thought of, and is applicable in most places for counteracting the evil; I mean a syphon—and this hint may prove of service to some. A creep, or, as the Welsh miners term it, pwcca, is a swelling or upheaving of the floor of the coal, which, in general, is either dark shale or fire-clay; if the former, through the effects of air and water penetrating into it, it creeps or puffs up to such a degree in some collieries, as to require the work of men to keep the roadways clear, by constantly cutting the bottom; in the neighbourhood of Pontypool, I have seen cylindrical brick arches crushed almost to powder through the effects of a creep; in some works men leave their work at night, with a clear headway of nearly six feet, and return, on the following morning, with, perhaps, barely four feet. The best preventative is to keep the water from running over the bottom, by which it soaks in, and, if possible, lay troughs alongside to take the water. These statements are, however, leading me gradually to a treatise on practical mining—a subject which, at some future time, I shall feel pleasure in bringing before your notice.

ON THE MACHINES FOR RAISING AND LOWERING MINERS, AND ON THE USE OF THE IRON WIRE ROPE, IN THE MINING DISTRICT OF THE HARTZ.

BY JOHN TAYLOR, ESQ., F.R.S., &c.

[Read before the Royal Cornwall Polytechnic Society.]

As some things came under my notice during my recent visit to the mining district of the Hartz, which may be interesting to the members of the Polytechnic Society, I will endeavour to communicate the result of some of my observations and inquiries. In the first place, I was desirous of knowing whether the machines for raising and lowering the men continued to answer their purpose satisfactorily, and whether, as the best evidence of this being so, they were extending in use. I found that they were spoken of by all the principal officers of the mines in terms of great commendation. I heard of no adverse circumstances that had occurred in using them, and I understood that they were now applied in every situation that afforded facilities for erecting them. I saw one in action, which I need not describe, as you have a perfect account of the construction, in the reports of the society, but it appeared to me to be inferior to what has been executed at Tresavean, the brackets or platforms on which the men stand were small, and the iron loops for holding by were not, in my opinion, very conveniently arranged. The stroke of the rods, also, was much shorter than that proposed to be adopted in Loam's machine; still the arrangement seemed to be perfectly effective, and the ease with which the men seemed to step from one rod to the other, and were thus carried up or down, was very pleasing to witness, and had rather a striking effect in its appearance. In one of these machines, which is carried to a great depth, it has been attempted to strengthen the timber rods, or to give them additional security by attaching to them a wire rope. I doubt much whether this be a good way of accomplishing this purpose, and I had much conversation with our friend Mr. Jordan, the Machinen Inspector, on the subject.—It is found that the wire rope when extended and stretched in connection with the rod, being in a state of rest and exposed to the wet and to the heated air of the mines, soon oxidises, and may thus become considerably weakened, in a manner that may easily escape observation, and thus a delusive appearance of strength may be relied upon. As the wire ropes which are in universal use now in the Hartz Mines, for drawing up the ores and waste, are not subject to oxidation in any degree that sensibly impairs their strength, this defect in another application of them was not foreseen, and the difference must, I conceive, be accounted for by the fixed state in the one case, and the constant motion in the other. I suggested to Mr. Jordan that the oxidation might, probably, be prevented by a process now much used in France, but which I have not heard much of in England, and that is coating iron with zinc, in the same way as it is covered with tin in the manufacture of tin plates. This is termed galvanising the iron, and I know, from the best authority, is very successful in protecting it from rust. It is commonly applied to wire work that is to be exposed to the weather; such as trellis work for gardens, &c., and is performed after the wire is woven into the forms required, and at a very cheap rate. It unites or solders the joints or crossings, gives the whole a very pleasing appearance, and is effectual in preserving it for a great length of time. For wire ropes that are extended in a rigid state, such for instance as standing rigging, it might probably be advantageously adopted, though it probably might not answer for those which are employed to wind on whim cages, and to run over pulleys, and in which cases, indeed, it does not appear to be required. The members of the Polytechnic Society are aware that the principle upon which the machines for raising men from the mines have been constructed, was suggested almost contemporaneously in Germany and Cornwall, without any communication between the inventors at either place, and it is one of numerous cases that might be adduced, where the merit of invention has been due to more parties than one. I felt some interest in inquiring as to what led to the suggestion of this important application of mechanical power in Germany, knowing that in Cornwall it had its origin in the benevolent and generous exertions of some distinguished members of the Polytechnic Society, who, desirous of remedying a great evil, stimulated ingenious men to attend to the subject, by premiums offered for the best means of facilitating the ascent and descent of the men employed in deep mines. In Germany the invention seems to have originated with an individual, who in contemplating the alternate motion of the two pump-rods, which, as you know, are always employed in their shafts, when the power is derived from water-wheels, saw that a body moving from one rod to the other, would be carried upwards or downwards according as the direction of this motion from the one to the other was managed. He proposed to take advantage of this for conveying the men to and from the deeper parts of the mines—the idea was approved, and was very shortly carried into successful operation. So that it appears that in the one case the invention was produced by the desire publicly made known of lessening the labour and avoiding the injurious effects attendant on the general system of climbing by long ladders; while in the other the idea of the mode by which men might ascend and descend without exertion first occurred, and the value and importance of the application was subsequently thought of. In the mines of the Hartz nothing engaged my attention more than the universal employment of wire ropes, for drawing the ores and waste from underground; this appears to me to be one of the most important improvements in the economy of mines that has for some time been made, and as it is but now beginning to make progress in this country, I am induced to notice it in the hope that what experience may have been gained in Cornwall may be gathered at the next meeting of the society, that the matter may be discussed, and the results made more generally known. The merit of this invention is due to Mr. Albert, the able and enlightened principal officer of the mining administration at Clausthal, who gave his anxious attention to this subject, and, after overcoming many difficulties, succeeded in bringing them to their present perfect state. The first information respecting the use of wire ropes afforded to the English miner, was by Count Breuner Oberberg Hauptman (the title of the chief director of the mines of a country) of Hungary, by a paper which he communicated to the British Association [illegible]

[illegible]

them over pulleys of much smaller diameter. I was, however, surprised when I visited the iron-works at Ilsenburg, at Rothehütte, and at Königshütte, to find wire ropes used on cranes in the foundries, and in machines for raising iron ores perpendicularly in iron-waggons, to the top of high furnaces. In these cases the barrels on which the ropes wound, and the pulleys over which they worked, were necessarily very small in diameter, they seemed as pliant as they need be, and to have sustained no injury in use. I was informed that for such purposes the ropes were formed of a greater number of smaller wires, by which it was found that they endured the bending to a more acute angle without injury. I notice this to show that they may be adapted to almost every use to which cordage is applied.

THE PRECIOUS METALS OF MEXICO.

[Concluded from the Journal of the 4th inst.]

Although the Mexicans have great skill in the method à patio, they leave always in the residue traces of silver, weaker or stronger, according to the double sulphurets there are in the mineral. At Guanaxuato, where the mineral is composed of native silver, or the sulphuret, with a little of pyrites, galena, or blende, the loss is 10 in every 100 of whole produce; at Fresnillo, where the mineral abounds in galena, pyrites, and blende, it is 20 in the 100; at Zacatecas, where the mineral contains much antimonial sulphuret of silver, the loss is 35 to 40 per 100. Sometimes these losses, which amount to almost two-fifths of the whole product, would not take place, if a better method could be discovered by the humid way, and towards which all the researches of chemistry should be directed. It is a fact worthy of remark, that since the discovery of amalgamation à patio, for which we are indebted to Medina del Campo, three centuries since, chemistry has produced no change in the method, as though she had arrived at perfection. M. Duport, who had placed at his disposition the archives of the family of Cortes, found documents which proved the quantity of silver extracted from the minerals of Tasco from 1570 to 1585 corresponding to the contents of [illegible], and loss of mercury 150 per 1 cwt. of silver obtained, and M. Duport found the same proportion maintained in the experiments which he made himself; he was led, therefore, to believe that this mode of amalgamation is but little susceptible of improvement. The hot amalgamation (cazo), introduced by Alonzo Barba, and so called because the operation is performed in a furnace with a copper bottom, a metal which reduces the chloride of silver, is less used in Mexico than in South America, where the minerals contain a great quantity of chloride of silver, or bromine, a necessary ingredient in the amalgamation; in Mexico this process is only applied in those localities where the mineral contains a large quantity of chloride of silver, or bromine. It is necessary to submit minerals to the same mechanical preparation for amalgamation by the patio system. The work of M. Duport contains all the plans and details relative to the conducting of the operation. Having observed that this system was but little used in Mexico, and was susceptible of great improvements, M. Duport proceeded to one of the principal workings, for the purpose of making a series of experiments on as large a scale as possible, with a view more especially to ascertain the possibility of reducing the loss of mercury to an insignificant point, and to ascertain the possibility of reducing all the silver ore of Mexico by this process. His intention is, ultimately, to communicate the results to the academy; and, although these experiments have not yet been fully completed, yet he has already found an ingenious means to diminish the loss of mercury, by putting in the ore but four times (in mercury) the weight of the silver contained in the ore, and this at different times, so as to make the amalgamation complete; so long as the mercury does not exceed this proportion, the chloride of silver is decomposed by the copper, and not by the mercury, and, further, the copper bottom of the furnace remains uninjured. We will merely mention another improvement, not less important than that which we have referred to; it relates to the improvements he has effected in the dressing of different sorts of silver ore. M. Duport, in treating the question of the precious metals of Mexico, has not confined himself to a geological description of the country, the auriferous deposits, the mode of extracting the mineral from the ore, the different ways of dressing, and the produce obtained by each, but has entered at great length into the consideration of various matters of a financial nature connected with this subject, the duties charged on the produce of the mines, the duties on exportation, [illegible]

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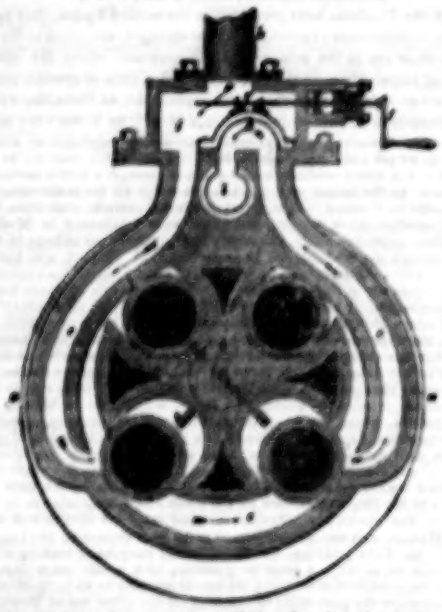
BEALE'S PATENT ROTARY ENGINE.

In conformity with the promise made to our correspondent, "A Subscriber," whose inquiry appeared in the *Mining Journal* of the 28th ult., and to meet the wishes of many others, we now give a general description of the rotary engine of J. T. and B. Beale, of East Greenwich, with their patent boiler, illustrated by a diagram of the former. When a paper, description of this engine, which has caused considerable interest in the scientific world, was read before the Society of Arts by Mr. Whishaw, in June last, we told before our readers some account of its principles and powers, but without any cuts; the following will, we trust, render the matter clear and intelligible to those of our readers who have not had an opportunity of examining the engine. The annexed engraving represents a ver-

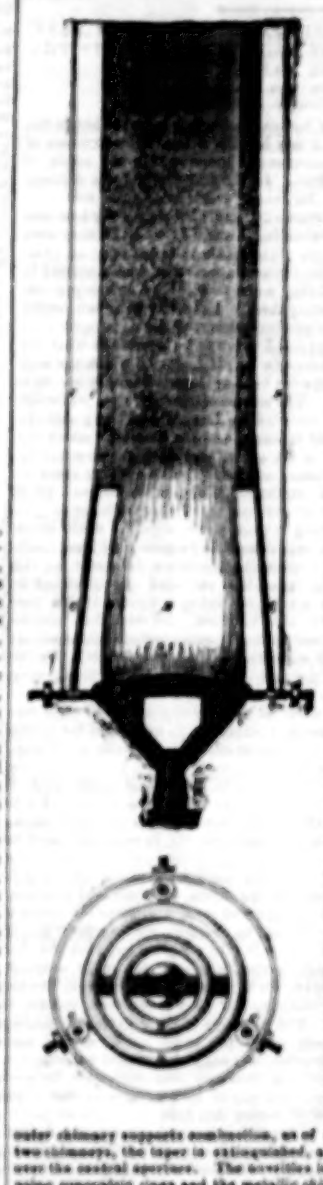


tical section of the engine; *a a* is a cylinder, forming the case or body, 24 inches diameter, and 9½ inches long; within this cylinder, but not concentric with it, is a solid one, *b*, revolving on an axis, in such manner that, while the upper part is nearly close to the outer case, there is a space downwards on each side of the circumference, increasing in width to the bottom, where it is full one-eighth of the diameter, as seen at *c*. In this solid cylinder are four apertures for receiving the four rollers, *d*, *e*, *e*, *e*, each of which is 4½ inches in diameter, and 9½ inches long; *c* is the induction, and *s* the eduction pipes, which may be reversed instantly by the handle, *f*, regulating the screw, *g*, passing through nuts on the slide valve, *h*, working in the steam box, *i*; *k* is the pipe for supplying steam from the boiler, and *l* the outlet by which the steam escapes, either to the atmosphere or to the condenser. On steam being admitted at *k*, it follows the course of the arrows, and impinging on the roller, *e*, carries the solid cylinder and rollers round, until *e* arrives at a point past the eduction pipe at *s*, when the steam before the roller, *e*, escapes. The roller, *d*, receives the continued pressure of the steam, the others in rotation, as they successively pass the induction pipe, keeping up a rapid and powerful rotary motion, which can be at once applied from the axis of the engine. The four rollers, which, from the eccentric position of the rotating cylinder, are continually changing their position in the cavities, would be always carried close to the circumference of the outer cylinder, at *c*, by their own centrifugal force, in addition to which there are two pins, *n n*, which pass through, and move freely in the centre of the solid cylinder, and always keep two opposite rollers equi-distant from each other. It will be seen, that by moving the slide valve quite across the steam box, the present eduction pipe will become the induction, and *vice versâ*, and the motion of the engine is instantly reversed; by moving the valve to the centre, it closes both inlet and outlet, and the engine is immediately stopped. The boiler for which Mr. Beale has obtained a patent is, for its size and capabilities, worthy of the engine to which it is applied; it consists of an iron case, containing a series of tubes, fixed vertically—the height of which is 5 ft., and 2 ft. 7 in. in diameter; it contains what is termed a mud space below the tubes, in which the blow-out cocks are fixed, by means of which any accumulation of mud or other deposit can be easily removed. Besides the saving of fuel which is effected by those boilers, and which in one boat to which it has been applied—viz., the *Richmond*—amounts to 10 cwt. per day, an incrustation has ever been discovered to remain on the tubes, but it has been found that, as soon as any deposition takes place on their insides, it cracks off, falls into the space above mentioned, and is blown off with the waste water; and this, we believe, is an advantage which has not yet been claimed for any other boiler, nor do we think it has yet been satisfactorily accounted for. The *Flying Giant*, an iron boat, which has been fitted with a rotary engine and a screw propeller, made an experimental trip on Friday last up the River Lee, where twelve locks had to be passed in a distance of seven miles, which was, notwithstanding, completed in 1 hour 45 minutes. This boat has made repeated experiments since our notice in June last, and, taking all disadvantages, among which is one which deserves consideration—viz., that in her build she is not calculated for speed, having been intended for a man-of-war's boat—she has averaged ten miles an hour; the propeller is 3 ft. 1 in. in diameter; the dimensions of the engine are as stated above. Mr. Beale nominally calls this size an 8-horse power engine, but, as an analysis of its power, taking the radius or centre of pressure at 7 inches, the number of revolutions at 320 per minute, the ordinary pressure of steam at 40 lbs. to the square inch, and the area of that part of the rollers receiving the pressure 14 25 inches, it will be found that this little machine can, and does, easily exert an actual power of eighteen horses, and the consumption of coke being under 40 lbs. per hour, or 7 lbs. per nominal horse-power, gives but 2·20 lbs. per horse-power per hour for the actual work performed. With a small engine only about 3 inches diameter, a powerful current of steam, and no heavy machinery to move, the almost incredible number of 30,000 revolutions per minute have been attained, and it is confidently stated that even this might be considerably increased.

Railway Contracts.—The great case of "Rangeley the Great Western Railway Company"—(the judgment to which was reported in the *Mining Journal* of the 20th ult.)—involving upon the question of contract as important results as were anticipated in the great case of "Small and Attwood," we are induced to give place to the following interesting statistics, for which we are indebted to our contemporary the *Railway Times*:—The first bill was 913 folios—the amended bill 1117. The first supplemental cost bill 561 folios—the second supplemental bill 555 folios. The first answer 1000 folios—the second 132 folios—the third 310 folios. The first exceptive affidavit upwards of 600 folios. The plaintiff's evidence 1900 folios. The defendant's 400 folios. Total of folios upwards of 6736, for which an office copy charge was paid of 1945 pounds, besides extraordinary allowances! Short hand notes on settlement upwards 2200 folios. Observations 31 briefs. The brief brief, embracing these points, for counsel, would be nearly 100 brief sheets. Sir W. Follett's fee was 300 guineas, and 100 additional; with consultations, making 1000. Mr. Bruce had 200 guineas, and 100 additional; Mr. Richards 200 guineas; Mr. Bowyer 150 guineas, and 50 additional. In the early stage of the cause the counsel had fees as follows:—First counsel, 100 guineas; second ditto, 100 guineas; third ditto, 50l.; besides numerous other counsel fees—making a total to himself's fine alone of nearly 2000l. The Vice-Chancellor has already ordered the plaintiff to pay a great part of the costs of these motions! The sum was five years in progress, and the same solicitors were for the company that were engaged in Small and Attwood—viz., Messrs. Swain, Stevens, and Co., Frederick's place, London. The short-hand writers' bills amounted to nearly 400l.! Thus it will be seen that going to "law" is a rather expensive amusement.

THE BOCCIUS LIGHT.

Having, for several weeks past, adopted these burners in our office, we are enabled to bear testimony to their superiority over the Argand burner, bat's-wing, jet, or any other description used for gas; the light is brilliant, and diffused over the whole apartment, while its intensity is so great, that we think the inventor is fully justified in his statement, that the inch burner has as much illuminating power as two Argands, and the 2-inch equal to six Argands; the former consumes five feet, and the latter fourteen feet per hour. The public demand for this light is most rapidly extending, and the fact speaks volumes in its behalf, that the greater number of gas companies, who were at first most hostile to it, are now promoting its use, by recommendation, and every other means in their power. Another burner on this principle, called the "fine light," will shortly be brought out, which is stated to give a finer light than the "bat's-wing," will consume about two and a half feet per hour, and will be peculiarly adapted for a street light, and for every description of manufactory. The following accurate description of the Boccius Light appeared in the last *Illustrated Polytechnic Review*, and which, for its general correctness, we adopt:—



"The burner of the Boccius light consists of one, or several, concentric rings; when more than one is employed, the inner ones rise to a higher level than the outer, as shown in the annexed engraving, B B, and are perforated with numerous minute holes, in about the proportion of sixty to a circle of an inch diameter. The inner are supplied with gas from the outer, and to make up for the diminished supply, the holes in the inner are rather larger. Above the burner, at a given distance, two concentric metallic chimneys, D, are placed, whose diameter is regulated, in a great measure, by that of the outer ring. The chimneys are supported by three wires, C, upon the glass holders, and surrounding the whole a glass funnel, F, proceeding from the level of the burners to the top of the metallic chimneys. The upper part of these glass funnels is frosted—the lower is transparent, to emit the light. The glass in the smaller burners is perfectly straight—in the larger ones slightly bell-shaped at the bottom. When the gas is turned on and lighted, the lower part of the burner—that is, the rings, B B, and crutch, A, become to some extent heated, and communicate a portion of their heat to the ascending gas. The amount of heat is from the construction (accuracy having been attained by experience) so nicely adjusted, that no carbon is deposited in the ring; but the warm gas escapes, ready to combine with oxygen on a slight increase of temperature. The cold air, too, in rushing between the crutches and rings, becomes warmed, and the burner is thus supplied with hot air—no air being admitted except from the bottom, it, of course, can produce but a very insignificant cooling effect on the flame. The chimneys, especially the inner one, rob the ascending current of a great portion of its heat, which it in turn communicates to the upper part of the flame, and carries the particles of carbon there to an intense temperature, causing them ultimately to unite with oxygen. The quantity of air entering is so regulated by the size of the separate openings, that it produces nearly a perfectly cylindrical, instead of a conical, flame. By the incandescent state of the inner chimney, the products of combustion are separated from one another, and appear at different positions. The ascending current of air between the glass and outer chimney supports combustion, as of a taper; when placed between the two chimneys, the taper is extinguished, and re-lighted again when brought over the central aperture. The novelties in arrangement of this lamp are the using concentric rings and the metallic chimneys. We have, in the engraving, represented a large double-ring burner in the centre; the diameter of the outer ring is five inches; and of the inner, three inches. This sized burner will consume about fifty feet per hour; and be equal to forty-eight Argand burners, consuming five feet per hour, or two feet; the saving, is, therefore, immense. These burners have been subjected to the most severe scrutiny; they have been examined and tested by some of the most expert experimentalists, and have passed the ordeal; indeed, all those who have had an opportunity of examining and proving them, concur in awarding to them the highest praise. Mr. Mackay's Hall of Commerce, in Threadneedle street, is illuminated with this light. So also is the London Coffee-house, Ludgate-hill, as well as a number of churches and chapels, and many other public establishments. Shopkeepers, too, patronise these burners extensively, in consequence of the exclusive mild gas being by them entirely carried off, and thereby no injury caused to articles exhibited in their windows. The Boccius Light has also been erected at Charing cross for many months, where it brilliantly illumines that great thoroughfare for a considerable distance. The advantages which the patentee offers to the public, and proves his right to possess, are—1. Obtaining the greatest quantity of light from the least quantity of common gas. 2. From the small quantity of gas consumed, the very trifling amount of deleterious gas produced. 3. From the same cause, the comparatively small amount of heat generated. 4. From the complete combustion, the impossibility of escape of the noxious inflammable gas into the air. 5. The complete absence of soot, smell, and smoke. 6. The durability of the apparatus, its great simplicity, and the ease with which it is managed. 7. The possibility of supplying, with success, the principle to burners of all sizes, from one consuming one foot, to another consuming 100 feet per hour. 8. The easy mode of ventilation it affords, by placing a ventilator in the roof, immediately above the light, if it communicate with the air. 9. The entire absence of all danger, there being no gas used besides the common carbureted hydrogen gas; consequently, no explosion can take place. 10. The facilities, save for the first time offered, of introducing gas into private dwellings, from which it has hitherto been carefully excluded. 11. The easy manner in which the burners are sold, placing them within the reach of all classes. 12. The great reduction to the number of lights generally used, affording a saving of at least one-half; in some cases, reaching to 80 per cent."

In addition to the above, it will be found of much advantage to stalesmen, draftsmen, and artists, as the light may be concentrated on any object—scattered at pleasure, or diffused over the whole apartment.

Three storeys of Stalactite.—Among the treasures of the British Museum is a splendid table formed by the process above described. It is a real scene in Derbyshire appertaining to this formation, and situated on the estates of his Grace the Duke of Rutland, a square wooden pipe which was employed to carry off the water was found to be choked up, and, on investigation, proved to be completely occupied by a deposit of limestone, formed by the water in flowing through the pipe. A very curious instance of the plastic power of nature, exemplified in that remarked under other circumstances, was also observed. There are certain embedding shells (the helix) which effect themselves to rocks, and at the point of junction the attached valve is found to narrow the very orifice of the rock to which it adheres. Thus, in the singular object, so recently here the cause, as it has been deposited, successively by moisture, assumed the character of the wood on which it has been formed, with its grain, knots, stains, and markings, as to render it impossible to ascertain the difference by the eye, and it is only by the actual touch that we are determined to be merely stone, and not the wood to which it presents so perfect a resemblance. Portions of these slabs were formed into a table, and presented by the Duke of Rutland to the British Museum, where the singular combination of art returns to show its resemblance thereto and adds to its usefulness. A similar table adorns the terminal hall of Belvoir Castle.—*Derbyshire's Geology.*

MINING LYRICS—No. III.

THE SAL FORT.

He'd wander'd mid the craggy coasts,
Communed with spirits of the dead,
And sail'd the sea to foreign climes,
And learned things the living said.

And, oh, what joy intense was his!
And, oh, what sadness was his share!
How few his sensibilities
To things of earth, or sea, or air!

Whilst others sear'd on wings of flame,
Down diving was his hidden flight,
Beneath the bosses and broken lumps
Of those who gave the miner light.

He'd read the books of other lands,
Felt what a kindred soul can feel;
Gave to immensity his wing,
On comets' orbits space to wheel.

Smatt'rings of science, too, he had,
And could betimes of matter tell;
And many attributes of mind
He knew—alas! he knew too well.

And oft he'd muse a moonly—
Time and eternity his themes—
The past, the present, and to come,
And man, who ruminates in his dreams.

Mining traditions, too, he had,
Told by the fathers of the dead,
Amid the mists who stream'd for the
Ere "levins" went off above the head;
Penseneer, Nov. 2.

And pitmen Will and Coppers Jem,
And Sandry Kemp and Matt Trotter!
And what they said and what they did,
"Trudging from barking copper ore!"

He was not starv'd, as poets are,
Who sing away their late days;
For, know, he was a scribe by trade—
By night he sang his mining lays.

He kept his "shop"—bishop kept him—
And so he seldom was in want;
But money he knew not to keep,
Since mining made his pockets scant.

Yet more he felt the proud man's scorn,
Than e'en the blight of low estate;
When *Mining Journals'* wing'd his words,
He deem'd himself among the great!

He'd traverse burning mountains' wombs
To drink the molten lava there;
Or list the tales of Psyche's dreads,
That bid to stand erect the hair!

And he would dig in fancy's mine,
And polish gems long treasur'd there,
And bring his jewels to the light,
To beam a brightness on despair.

And, oh! what bounds his spirit made,
From nothing to the CAUSE of all—
Till mental miners around him crowd'd,
And mailed into space the ball!

Alfred T. J. Martin.

Substitute for White Lead.—At the Paris Academy of Sciences, on the 13th instant, an interesting paper was read, on the means of entirely dispensing with white lead as a pigment, and thus, by almost doing away with its manufacture, and substituting an article free from the poisonous qualities of lead, prevent the alarmingly frequent and distressing maladies occasioned by its use, which, in most cases, end in lameness for life, insanity, or premature death. The public, in general, are but little aware of the distress occasioned among the families of men engaged in this deleterious manufacture, and those employed as house painters, few men in constant work but who are more or less debilitated by it, and some idea may be formed of its effects, when we state that, in 1841, 302 patients were admitted to the hospitals in Paris afflicted with painters' colic. M. de Ruiz, the author of the paper, recommends, instead of white lead, the oxide of antimony, commonly known as flowers of antimony; it is of a most beautiful silver white, preserves its colour when ground with oil in a most extraordinary degree, and, when mixed with other colours, has a far superior effect to lead. Its use it is stated to be free from all injurious effects, giving out no metallic vaporous exhalations, and, if it is found as good a preservative as lead, a great inducement to its adoption will be its price, it being two-thirds cheaper than the latter article. It is to be hoped some parties will be found who will take up the manufacture on a scale of sufficient magnitude to fairly test its merits, and it is more than probable that, in addition to the satisfaction which must be felt in removing a cause of most dreadful disease among a numerous body of artizans, a profitable trade would be created, which would amply repay for the capital and time bestowed upon it.

On Certain Movements in the Parts of Stratified Rocks.—In a paper, read at the late meeting of the British Association, the author (J. Phillips, Esq., F.R.S.) observed, that for many years the attention of geologists had been particularly paid to the internal structure of rocks, and though Professor Sedgwick and Mr. Hopkins had made great advances, there were points still remaining to be investigated before the forces could be explained by which these phenomena had been produced. Every form of strata must be considered, to understand the nature of the mechanical forces which have produced the cleavage. When layers of concretionary ironstone occur in slaty rocks, the cleavage planes are arrested and troubled by them, from which it appears that the particles had become solid previous to the division of the strata by cleavage. Attempts had been made to imitate cleavage. Mr. Fox, of Cornwall, had passed electric currents through wet clay, and had thus produced fissures parallel to the surface of the mass, which experiment, he thought, important, but not sufficient. In North Wales, the cleavage planes of the slate rocks maintained nearly the same direction more than fifty miles, varying only from two to three degrees. The shells in slaty rocks were generally distinctly marked by ferruginous lines, caused by their decomposition, and the form of their outlines was often remarkably changed. The lepidons of North Devon, and the spirifers, were crumpled up, or else much attenuated. The trilobites of the Llandeilo flags were found in three distinct forms as the distortions took place, either longitudinally, vertically, or diagonally; this would appear to be the result of a creeping movement of the particles of rock along the line of cleavage, rolling them forward in a direction always uniform.—Mr. Hopkins considered that the phenomena of cleavage could only be accounted for by lateral forces, but to estimate the effects of molecular action required a much more correct mathematical analysis than we at present possess.—Mr. Phillips remarked, that all the great anticlinals in South Wales, and, he believed, in the south of Ireland, had affected also the silurian rocks, carboniferous slates, mountain limestone, and all the coal strata. The magnesian limestone rests in such a manner as to indicate that those movements took place previous to its deposition. The cleavage, therefore, must have taken place subsequently to the newest coal strata, without affecting more modern formations.—Mr. Binney observed that coal shales, in the intense heat of a furnace, often exhibited vertical lines of cleavage, breaking them up into hexagonal prisms. Coal itself generally presented three distinct lines of cleavage, one parallel to the lines of bedding, one at right angles to it, and one in a diagonal direction. He mentioned a sigillaria one foot in diameter, found upright in the Pennant coal, the bark of which was converted into bituminous coal, with vertical cleavage, while the interior had the chamberlain character. He also announced the discovery of a tree nine feet high, in an upright position in the coal strata at St. Helen's, Liverpool.

Subterranean Ice Caverns.—At a recent meeting of the members of the Liverpool Library and Scientific Institution, held on the 10th inst., several scientific communications were made, among which was one by Mr. Murchison, giving an account of a cave upon the salt steppes of Orenburg, in Russia; one of a number of similar excavations found opening on the south side of a long but low hillock of gypsum; the entrance is narrow, but internally it is fifteen feet high, ten paces long, and seven wide, and sends off irregular fissures into the rock. The peculiarity distinguishing this cave from the others in the neighbourhood is, that in summer it is so cold that icicles are continually formed from the percolation of water, and hang from the roof, while in winter all congelation ceases, and the cave becomes so warm that the Russian peasants sleep in it without their sheep skins.—Dr. Carson read a description of a similar cavern in the Carpathian Mountains, contained in a letter of Matthias Bel'ius, in the forty-first volume of the *Transactions of the Royal Society*. The county or province of Thora, at the base of the Carpathians, is surrounded by hills, one of which, between the villages of Sadlowe and Borowa, contains the cave, the entrance to which is seventeen fathoms high and nine wide, into which a constant and keen north wind continually rushes; the depths southward have never been penetrated. During the greatest heats of summer, the cold is so intense that the falling water is rapidly frozen, forming within the immense barrels, and increasing the frost and walls, which appear as if covered with the most brilliant crystal. At the remotest accessible part the cavern is fifty fathoms high and twenty-six wide, and from the heightened coldness it is probable the cave extends to a great distance. On the return of winter to the external world, the ice in the cavern begins to thaw, and, as the cold increases, it becomes free from ice or cold, and quite dry and warm, in which congregate numerous insects and small animals which cannot bear the intermediate season. Sir John Herschel had been applied to for an explanation of the phenomenon, and suggested that the temperature of the surface penetrates to depths proportioned to the conducting power of the rock, and if the external heat was always uniform, there would be no limit to its extension, until the whole mass became of the same heat as the surface—the temperature of the surface being, however, alternating, there is a limit to the depth attained of the maximum heat or cold, the greatest heat arriving at this depth in winter, and the greatest cold in the midst of summer.—Dr. Carson considered the account of the Hungarian cave illustrated the theory of Dr. Hope. It appears that fissures from the surface traverse the cold zone in their progress to the centre. The air within these fissures, cooled down to the temperature of the cold zone, acquires increased density, and by passing over the walls of the cavern it cools them down, and in turn cools the intermediate instrument by which the freezing is effected—the mean temperature of the earth surrounding the cave, which is beyond the existence of external waves of heat or cold, dissolving the ice from the density of the air in the fissures or chimneys, and the external air being nearly balanced. He considered this theory might to some degree account for the progressive recession of glaciers; the cold right arc of the glacier penetrating by the increased density, the porous structure, would circulate a sufficient quantity of cold to freeze the water, and produce that distention which, with the plastic nature of the ice, would explain their movements.

Plymouth and Exeter Railway.—We understand that all the arrangements between East Devon and the company have been completed, and that Lord Courtenay takes his seat as one of the directors.—*Devonshire Chron.*

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